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BLACK MESA EXPERIMENTAL FOREST
(Submitted by G. T. Turner)

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A. Relation of Area to Research Work of the Region

The Black Mesa experimental area, located in southwestern Colorado, is presently the main study area for the Grand Junction Research Center. It was selected primarily as a site for investigating range and watershed management problems related to Thurber fescue grasslands, aspen, and spruce-fir types. On Black Mesa, as elsewhere in the Rocky Mountain region, these types are closely intermingled and are subject to multiple use. They occupy important water yielding areas, provide forage for livestock and game during summer months, and supply forest products for local use. Efficient management of these and similar lands in the Rocky Mountain region calls for greater knowledge than is now available.

Studies now underway on Black Mesa are concerned with:

1. Effects of different grazing intensities on forage and beef production.
2. Effects of pocket gophers on range and watershed values.
3. Relation of plant and ground cover to runoff and sediment production
4. Relative use of water by aspen, spruce-fir, and grassland types.

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Conditions on Black Mesa are considerably different from those at other experimental areas, yet they are representative of a sizeable area in the central Rocky Mountains. At the higher elevations, mixed stands of Engelmann spruce and alpine fir appear suitable for studies of forest management, forest insects, and forest diseases under conditions peculiar to the mesa type. At somewhat lower elevations aspen stands offer similar opportunities and, on slopes below the mesa, oak brush poses problems that deserve investigation. Studies on Black Mesa will supplement but will not duplicate those conducted elsewhere in the region.

B. Description of Area

1. Location and Size

The proposed Black Mesa Experimental Forest is located on the Gunnison National Forest between Crawford and Sapinero, Colorado. It is 100 miles from Grand Junction and 45 miles from Gunnison. Access is provided by Colorado State Highway 92. Curecanti Creek forms the east boundary, which extends northward from the forest boundary to Township 51 North, New Mexico Principal Meridian. From this point the boundary runs due west approximately 1½ miles to the head of Crystal Creek. It then continues along the divide between Crystal Creek and Dyer Fork to the forest boundary on the west. The forest boundary that connects this point with Curecanti Creek forms the remaining boundary of the experimental area.

Except for the lower portions of drainages leading to Curecanti Creek, the area coincides with the Mesa cattle allotment on the Paonia Ranger District. About one-third lies in Montrose County and two-thirds is in Gunnison County.

Principal drainages include Crystal Creek (the only perennial stream that heads in the area), Mesa Creek, Mill Creek, Corral Gulch, Myers Gulch, and Long Gulch.

The proposed experimental area includes approximately 38,500 acres or 60 square miles. Except for 1500 acres of patented land, it is owned by the federal government and administered by the Forest Service. Legal description of land within the boundaries is as follows:

| Township | Range | New Mexico Principal Meridian Sections | Portions of Sections |
|---|---|---|---|
| 49 North | 5 West | 4-8 17-19 | 3,9,16 |
| | 5½ West | 1,2,11-14 23,24 | |
| | 6 West | 6-17, 20-29 | 1,2 |
| 50 North | 5 West | 2,10,11,14-16 20-23, 27-34 | 1,3,8,9,12,13 17,19,24,26,35 |
| | 5½ West | | 25,36 |

Because land lines in the northern part of the area are indefinite, they are not shown on the accompanying map.

2. Acreage by cover types (exclusive of patented land)

| Type | Acres | Percent of total |
|---|---|---|
| Spruce-fir | 10,700 | 29 |
| Aspen | 10,000 | 27 |
| Mountain brush | 9,300 | 25 |
| Grassland | 7,000 | 19 |
| Total | 37,000 | |

3. Physical characteristics and climate

Black Mesa proper, the heart of the experimental area, is part of the Colorado Plateau at the western edge of the West Elk Mountains. Roughly wedge-shaped, it gradually rises from an elevation of 9,000 feet along its western base to over 10,300 feet at the apex. It occupies about one-half of the experimental area. The topography is gently rolling with drainage predominately to the southwest. Slopes bordering the mesa are steep or even precipitous, especially along the Gunnison River and Curecanti Creek. There elevations drop almost 2,000 feet in one or two miles. North of the mesa along Crystal Creek the lower slopes are fairly gentle and elevations range upward from 7,800 feet.

Capping the mesa is an erosion-resistant layer of volcanic material, principally Fiedra rhyolite and Huerta andesite. This is underlain with West Elk breccia which outcrops in limited areas below the rim. Highly erodible Mancos shale is next exposed in a belt along Crystal Creek and Curecanti Creek. Though minor in aerial extent, Dakota sandstone, Morrison shale and sandstone, and pre-Cambrian schist are also present in or near the Gunnison River canyon. The characteristics of these formations are largely responsible not only for the nature of local terrain but also for the characteristics of soils derived from them.

Soils on the experimental area as a whole are fertile and productive. However, on the mesa top, depth of surface soils is highly variable. This apparently is due to different rates of

weathering and disintegration of the parent material, natural or man-caused erosion, and biologic factors. Mima mounds, of unknown origin are conspicuous in many grassland parks. As a result of these variable influences, subsoil and rock are exposed in local areas, while elsewhere dark brown loamy soils reach a depth of 3 feet or more.

Surface soils are relatively high in infiltration and water holding capacity and are quite stable. While the solum may extend to a depth of 8 feet, it commonly contains many semi-decomposed rocks and, less frequently, a claypan.

Although soils below the mesa rim appear to be more uniform in depth, they are highly variable in texture and other characteristics. Those derived from shales of the Mancos and Morrison formations are fine-textured, absorb water slowly, and are highly erodible when the plant cover is destroyed. Other soils appear to be more similar to those on the mesa, although they have not been investigated in detail.

The local climate of the experimental area is best revealed by the type of plant cover present. Both change rather gradually with elevation and more abruptly with aspect. Below 8,500 feet the mountain brush type predominates, with Gambel oak, serviceberry and big sagebrush as the dominant species. Average annual precipitation in that zone is estimated to be around 15 inches. The growing season is roughly May through September. Summer thunderstorms, sometimes quite high in intensity in July and August, account for

about half of the moisture received. June is normally a dry month at all elevations; otherwise precipitation is fairly well distributed throughout the year.

Between 8,500 and 9,000 feet the brush type continues to dominate south-facing slopes but gives way to aspen, Engelmann spruce, and Douglas fir on north slopes and along moist drainageways.

Above the mesa rim, from 9,000 to almost 10,000 feet, aspen and mountain grasslands are the most extensive, although the spruce-fir type is common on north slopes. At higher elevations the spruce-fir type occupies most of the area, with small grassland parks becoming more subalpine in nature.

Official weather records from Knott's ranch, located just outside the experimental area at an elevation of 9,500 feet, provide a reliable index to the climate in that vicinity. Average annual precipitation during a 23-year period (1920-1942) was 22.54 inches, with yearly totals ranging from 15 to 29 inches. Average precipitation during the main part of the growing season (Jun 15-Sep 15) was 5 inches or 22 percent of the total. Snowfall accounted for about two-thirds of the moisture received during the year, with depth of snowpack often reaching 4 feet. The ground was generally snow-free from May 15 to October 15, although the period varied widely from year to year. Rainfall intensities seldom exceed 2 inches per hour, judging from limited records available from a nearby location.

The mean annual temperature at Knott's Ranch was 38 degrees. Monthly averages range from 17 degrees in January to 59 degrees in July. Maximum temperature in July averaged 74 degrees, while minimum

temperatures in January averaged only 6 degrees. The highest and lowest temperatures recorded were 88 and minus 29. Although the average frost-free period is about 90 days, freezing temperatures are not uncommon during summer months.

At higher elevations precipitation is considerably higher and temperatures are lower than shown above. The snowpack may reach a depth of 6 to 8 feet with a water content of 24 to 30 inches. Snowbanks sometimes remain in timbered areas until the middle of July and the growing season is very short.

4. Forest value

Though timber on Black Mesa has served local needs since about 1880, a reliable inventory of the resource has never been made. Approximately 10,700 acres are occupied by mixed stands of Engelmann spruce and alpine fir and 10,000 acres are occupied by aspen.

The merchantable volume of virgin coniferous stands may approach 15,000 board feet per acre, most of which is spruce. Stands are uneven-aged, the larger trees with diameters of 24 to 30 inches being 250 to 300 years old. Dead and decadent wolf trees are fairly common in relatively young, mesa-type stands, indicating encroachment of spruce into grassland parks. At elevations between 9,000 and 10,000 feet, spruce and fir are commonly intermixed with aspen. Even in stands now predominately spruce, dead but standing aspen attest to a change in timber type.

Practically all spruce-fir stands have been selectively cut at least once, and much of the area has been logged 2 or 3 times. Early cutting was relatively light with removal of only the larger

trees. More recent cuttings have been in the nature of a commercial clear-cut, leaving only windbreaks, scattered seed trees and cull material. While advance reproduction is generally adequate to insure natural restocking, alpine fir appears to be more abundant than spruce on cut-over areas.

Fires have also taken a toll from timber stands on the mesa. Approximately 400 acres on the upper drainage of Mesa Creek were burned over about 1880, killing practically all trees and herbaceous vegetation. The area is now poorly stocked and even herbaceous vegetation shows little sign of recovery. While evidence of fire may be found in most other timbered areas, its effects are now largely obscured.

Coniferous timber harvested on Black Mesa is used primarily for lumber. For many years milling was done on site by several small sawmills, but recently most of the logs have been trucked to nearby towns. Present cutting from the one active sale in spruce amounts to about 250,000 board feet per year, and an aspen sale is limited to 400 cords. Aspen is being shipped to California for use as excelsior.

Quality of the remaining timber is only fair. Heart rot is common in both spruce-fir and aspen stands, and in certain areas, bark beetles have killed many of the larger spruce. However, the potential for growing timber on Black Mesa is good, as evidenced by annual rings and height growth.

Although suitability of the area for research in forest management, forest insects, and forest diseases has not been thoroughly appraised, mesa-type spruce and aspen stands appear to offer definite possibilities. Only through more intensive management and more efficient utilization will these types meet the increasing local demand for forest products.

5. Grazing value

Approximately 25,000 acres of the proposed experimental area are grazed by livestock. The remaining area is not suitable for grazing because of dense timber or steep slopes. Of the grazeable area, about 32% is in the mountain brush type, 28% is mountain grassland, and 40% is occupied by aspen.

In 1957 these lands were grazed by 1,672 cattle during a 4-month period. Non-use permits were issued for 100 additional head. The permitted grazing season for one-third of the animals extends from July 1 to September 30, and for the remainder the season is from July 1 to October 31. The cattle are owned by 21 permittees who are organized as the Black Mesa Cattlemen's Association and whose ranches are located near Crawford. Individual grazing permits range from 8 to 206 head, with a median of about 80 head. A good grade of Herefords, including cows, calves and yearlings graze the allotment under the supervision of 3 range riders.

The condition of the range varies greatly from place to place, depending upon the terrain, stock water supply, and other factors. Streambottoms and other areas where cattle tend to congregate are generally in fair to poor condition, whereas the less accessible

areas support a good stand of desirable forage plants. With better distribution of grazing the allotment may continue to carry the present number of livestock. Numerous stock ponds have been developed by permittees and the Forest Service to promote more uniform use of the range.

Use of the allotment is also influenced by weather conditions, elevation, plant development, and the kind of plant cover present. For example, the brush range below the rim is ready for grazing about 2 weeks earlier than that at higher elevations; low larkspur prohibits grazing of certain areas until it has produced seed; and forage in timbered areas is little used as long as grass is available in nearby parks. In the fall the tendency for cattle to drift to lower elevations calls for frequent riding. Not infrequently, early snowstorms force their removal before the end of the permitted grazing season. Nevertheless, the animals come off the range in excellent condition. Yearling steers in the experimental pastures have gained over 2 pounds per day, on average, during a 5-year period.

Death losses, due primarily to poisoning by low and tall larkspur, seldom exceed one percent. Though not always fatal, brisket disease, foot rot, and pink eye further contribute to the loss.

Black Mesa also provides forage for deer and elk during summer months. However, they apparently do not compete seriously with livestock under existing conditions. Much more evident is disturbance caused by pocket gophers. The activity of these rodents probably has a pronounced effect on range conditions and trend and Black Mesa affords an excellent location at which to study these relationships.

Many of the plants (represented by some 300 species within the experimental area) are common throughout the Rocky Mountain region. Among those in the mountain brush type are Gambel oak, serviceberry, big sagebrush, Kentucky bluegrass, bluestem wheatgrass, elk sedge, lupine and balsamroot. Characteristic of mountain grasslands are Thurber fescue, Idaho fescue, Letterman needlegrass, mountain brome, slender wheatgrass, geranium, hairy goldaster, aspen fleabane and Parry's rabbitbrush. On lightly grazed areas with deep soil Thurber fescue maintains dominance. However, Idaho fescue probably produces the most forage in the type as a whole. Herbaceous vegetation in aspen stands is variable and complex, with elk sedge as the prevalent species. Other common plants are wild strawberry, aspen peavine, butterweed, wild parsnip, vetch, sweet anise, and meadowrue. These and many other plants provide a varied and nutritious diet for livestock and big game.

Herbage production in open parks varies from about 1,000 to 1,500 pounds (air dry) per acre, both from year to year and from site to site. It consists of almost equal volumes of grass and forbs and only a minor amount of shrubs. Grasses provide most of the forage. In aspen stands production ranges between 500 and 1,000 pounds with forbs outweighing grasses and sedges almost two to one. Production in the brush type is similar to that in aspen except for a greater abundance of browse.

6. Watershed value

Water is perhaps the most valuable resource of Black Mesa. Water content of the snowpack at the higher elevations may approach

30 inches, much of which contributes to streamflow. While snow depth and water yield gradually decline with elevation, some runoff from snowmelt occurs even within the lower portion of the brush type. During the snowmelt period (late April to early June) streamflow is high and roily, yet it carries relatively little sediment. Thereafter it drops rapidly and nearly ceases by July 1 in all drainages except Crystal Creek. Runoff from summer storms, though seldom observed, carries much more sediment than does runoff from snowmelt.

Most of the water flows into the Gunnison River or its tributaries for use downstream. However, some water from Crystal Creek and Mesa Creek is diverted into storage reservoirs for local irrigation. In addition, numerous small stock ponds are filled during the snowmelt period.

Soil erosion appears to be a minor problem on the area as a whole. Nevertheless, it is evident along roads, cattle trails, streambanks, and other places where much bare soil is exposed.

7. Other values and uses

Recreation: Hunting, fishing and sightseeing are the principal recreational uses at the present time. While fishing is confined to Curecanti Creek and Crystal Creek, the entire area is open to hunting of grouse, deer, elk, and bear. A considerable number of local people and non-residents enjoy the hunting privilege. Though camping and picnicking are presently of minor importance, the demand for these facilities is likely to increase. Sites suitable for these purposes are relatively scarce.

Minerals: No known mineral deposits are present, though numerous uranium claims were staked in 1955. These claims were not developed and are now believed to be invalid. A block of 3,198 acres in the vicinity of the experimental pastures was withdrawn from mineral entry in 1956 as a safeguard against additional claims.

Agriculture: Climate of the experimental area is not suitable for growing farm crops (except hay) and no land has been cultivated except on privately owned property.

Hydroelectric power: Although still in the planning stage, the Curecanti dam project on the Gunnison River might have some bearing on future use and development of the experimental area. While proposed dam sites are outside the area, it is possible that construction will call for access roads or other installations within the boundary. Water impounded by these dams will not reach any portion of the experimental area.

Also under consideration is a proposal to divert water by tunnel from Curecanti Creek to Crystal Creek. However, this would probably have little or no effect on the management or use of the area.

8. Transportation and communication facilities

Black Mesa is accessible from May through October by Colorado State Highway 92 which joins U. S. Highway 50 at Sapinero and Delta. During winter months the road over the mesa is closed by snow and the only access is by snow-vehicles. The mesa proper is served by several dirt roads that branch off Highway 92. These are passable

from June through October.

Communication with the outside world is limited to radio contact with Gunnison, the nearest telephone being at Meek's ranch on Crystal Creek.

9. Public sentiment

Local citizens are interested in studies now underway and the Black Mesa Cattlemen's Association has actively supported and cooperated in the research program for several years. While no objections to the establishment of the Black Mesa Experimental Forest have been voiced, the proposal to set the area aside has not been publicized.

10. Conclusions and recommendations

Black Mesa offers conditions suitable for study of many problems related to forest, range, and watershed management. Results of such studies can be expected to apply to extensive areas in the Rocky Mountain region.

Use of the area for experimental purposes should result in few, if any, conflicts with existing uses. On the contrary, research finding may eventually lead to more intensive management and more efficient use of the resources available. Designation of these lands for research purposes, while not precluding uses normally provided by national forests, would call for somewhat closer control and integration of such uses in order to safeguard research needs and investments. Though portions of the area are not suitable for research, they are an integral part of the administrative unit

and should be included to facilitate administration. It is recommended that the area described herein be formally designated and established as the Black Mesa Experimental Forest.

C. Relation of Proposed Area to Use and Administration of Adjacent National Forest Lands.

Inasmuch as the proposed area is essentially a self-contained unit, its designation for research will have little direct bearing on the use and administration of adjacent lands. Timber sales on and near the area are largely independent, and grazing use is interrelated with that on other forest land only along a small portion of Curecanti Creek. However, research findings can be expected to apply directly to surrounding areas and should promote better management of their natural resources.

D. Proposed Administration of the Experimental Area

Routine administration, including the issuance of grazing permits, supervision of timber sales, fire protection, and road maintenance, will be handled by the district ranger and supervisor's staff of the Gunnison National Forest. However, to assure that future uses and developments do not jeopardize research needs and installations, administrative and research personnel will mutually agree in advance upon timber sales, special uses, changes in grazing management, range improvement programs, or other developments that might alter or destroy the usefulness of the area for experimental purposes. If mutual agreement cannot be reached at the local level, the question in point will be referred to higher authorities.

Administration of the research program will be under the direction of the research officer in charge. He will be responsible for planning the development of the area for experimental purposes so as to avoid conflicts in use and provide for future needs. Cooperative studies with other agencies will also be under his general supervision. Any change in, or addition to, the research program that is likely to materially affect livestock grazing on the allotment will be mutually agreed upon by forest officers following consultation with permittees.